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CERTIFICATION OF ATTACHED ENGLISH TRANSLATION OF PCT APPLICATION:

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I hereby certify the English translation attached is a true and accurate copy of the referenced PCT/ EP2004/009179 application.

John T. Winburn
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Reg. No. 26,822

REFRIGERATION DEVICE HAVING A DOOR SAFETY CATCH

The invention relates to a refrigerator comprising a housing which is constituted of at least two housing parts, amongst them a body and at least one door, said housing enclosing a heat-insulated interior compartment, and comprising a door safety catch that includes a catch element swivellably mounted against a restoring force on a first housing part and a projection mounted on a second housing part and cooperating with the catch element. A refrigerator with this type of door safety catch is known from DE 101 17 782 A1.

Refrigerators comprising a body and at least one door are usually fitted with a circumferential magnetic seal on their doors, which seals the interior in a largely airtight fashion when the door is closed and in addition holds the door in the closed position as a result of a magnetic force acting between the seal and a door frame on the body. However, the range of this magnetic force is very short. Thus, it cannot be reliably avoided that the door does not slam completely shut but leaves a gap wide open without this being seen in a conspicuous fashion from the outside of the refrigerator.

This problem is particularly disturbing in refrigerators with two or more doors which close interior compartments which are not separated from one another in an airtight manner. These interior compartments can, for example, comprise a freezer compartment and a cool compartment of a combination refrigerator or a cool compartment and a so-called cellar compartment which is held at a higher temperature than the cool compartment and is possibly only cooled by air exchange with the cool compartment. If a door is slammed shut in such an appliance, the resulting pressure thrust can have the result that the respectively other door springs open if a safety device is not provided to prevent this, by exerting a force on the closed door which supports the magnetic seal and holds the door closed.

In the refrigerator in DE 101 17 782 A1 such a safety device is formed by the projection and the spring-loaded bolt part which exerts a force in the closing direction when the door is closed and when the door is open, is pressed by the projection against the restoring force of the spring. Said bolt part is pivotally mounted about an axis in a bearing in a housing shell affixed to the body.

It has been shown that considerable forces act on the bearing of the bolt part when opening and closing the door. In particular, in the case of a plastic housing shell, the bearing can be damaged and even destroyed in extreme cases. This makes it necessary to achieve a stable design of the housing shell so that these forces can be compensated. It would be possible to fabricate the housing shell from a more stable material such as metal instead of plastic but this would result in increased production costs because plastic housings of injection mouldings are substantially simpler and cheaper to manufacture than metal housings.

It is thus the object of the invention to provide a refrigerator with a projection and a catch element where these disadvantages are eliminated.

This object is solved by a refrigerator according to claim 1.

Since the shaft of the catch element according to the invention is mounted so that it crosses a side surface of the housing part which carries it, considerable forces acting on the shaft can be introduced into the housing part whereby stresses on a housing shell are reduced and the requirements on the mechanical loading capacity of the housing shell are reduced. In the simplest case, the housing shell could even be dispensed with completely since it is no longer necessary as the bearing of the catch element.

A section of the shaft engaging in the housing part of the refrigerator is preferably accommodated in shank extending from a wall of the housing part into the housing part in order to give the shaft a stable hold. The shank is preferably formed in an end profile which forms the upper or lower flank of the door. The shank can be formed in one piece in an injection-moulded plastic end profile without any expenditure.

If the catch element is fixed on a flank of the door, it can be placed behind a decorative panel of the refrigerator so that it is covered and is not visible when the door is closed. The aesthetic impression of the refrigerator is thus not impaired by the catch element.

A restoring force for the catch element can be produced by a spring. In a preferred embodiment of the invention the spring is a compression spring. Thus, opening or closing of the door is not impaired by the spring. However, it is also possible to construct the spring as a torsion spring wrapped around the shaft. Such a torsion spring can, for example, be a coil spring or a spiral spring. The main advantage of this embodiment is the space-saving design.

The shaft can be a screw. This can be fixed quickly and simply on the one housing part by means of its thread.

Although the basic design of the invention does not necessarily require a housing, it can be advantageous to provide a housing in which the catch element is concealed. Undesirable external influences from the catch element can be repelled by the housing for example. For precisely the same reasons it can be advantageous to provide the spring likewise accommodated in the housing.

In order that the door can be mounted as hinged on the right or the left as desired, the housing can preferably be mounted on the door in two orientations twisted by 180° towards one another, each adapted to the selected hinging. Such a housing can appropriately be composed of two half-shells which are a mirror image of each other.

The projection preferably comprises two sloping faces facing away from one another for cooperation with the catch element. When the door is opened, the catch element is initially pressed back on the projection by sliding on one of the sloping faces whilst the catch element is then pressed back by the restoring force against the second sloping face on which the catch element slides, which drives the door in the completely open direction. The relationships are reversed during a closing movement.

In order to make it easy to close the door, but prevent unintentional opening of the door as far as possible, it is preferable if that sloping face which contacts the catch element when the door is closed is arranged at a larger angle to the direction of motion of the door than the other sloping face.

The projection can be formed, for example, by a tab projecting from the body. The tab can, for example, comprise an end section of a metal sheet bent to the right.

The projection is advantageously fixed to a door bearing attached to the body because the same fixing means can then be used for projection and door bearing. Thus, no additional fixing means or holes are required in the body.

The catch element for its part preferably has two sloping faces facing away from one another for cooperation with the projection. That sloping face which is in contact with the projection when the door is closed, is preferably arranged at a larger angle to the direction of motion of the door than the other sloping face.

A description of a preferred embodiment of the invention follows. In the figures:

Fig. 1: is a cross-section through projection and catch element in plan view when the door is closed;

Fig. 2: is a cross-section through a fixing of the catch element;

Fig. 3: shows the projection and catch element in cross-section during opening or closing of the door; and

Fig. 4: shows the projection and catch element in cross-section when the door is opened.

Figure 1 shows a part of a refrigerator according to the invention where a door safety catch 1 can be seen in cross-section viewed from above. From a refrigerator housing it is possible to see a part of the front of a body 2 and a door 3 in a closed state. The door 3 is pivotally fixed on the body 2 by means of a door bearing 4. The door bearing 4 is a metal fitting and comprises a flat strip attached to the body 2 by means of screws 5, and an arm bent away from the strip which bears an upright cylindrical pin at its free end which engages in a hole of the door 3 and thus defines its pivot axis.

The door safety catch 1 comprises a metal sheet 6, a catch element 7, a spring 8, a housing 9 and screws 10 and 11. The metal sheet 6 is fixed to the body 2 together with the door bearing 4 using the same screws 5. An end section of the metal sheet 6 is bent to the right as a tab 12 projecting from the body 2. The tab 12 has two sloping faces 13 and 14 facing away from one another, forming an angle. The sloping face 13 facing the body 2 intersects a line N perpendicular to the front of the body 2, which corresponds to the direction of motion of the door during opening, at an angle α of about 60°, the sloping face facing away from the body at a smaller angle β of about 20°.

The catch element 7 is fixed to the door 3 by the screw 10 so that it is pivotable about a vertical axis, as indicated by the double representation of the catch element 7, once in contact with the tab 12 and once in the pivoted back position. The catch element 7 also has two sloping faces 15 and 16 facing away from one another, forming an angle. In the closed state of the door 3 which is shown, the sloping face 15 of the catch element abuts parallel against the sloping face 13 of the tab 12. The housing 9 is attached to the door 3 using the screw 11 and also the screw 10. The catch element 7 is concealed inside the housing 9. The spring 8 is also accommodated by the housing 9. This acts on the catch element 7 and the screw 11. The spring 8 rests on the screw 11 and exerts a restoring force on the pivotable catch element 7 which presses the door 3 against the front of the body 2 and thus prevents any unintentional opening of the door 3.

Figure 2 shows a cross-section through an upper area of the door 3 and the door safety catch 1 mounted on the door, which runs through the catch element 7, the housing 9 and the screw 10. A front plate 21 and a rear wall 22 of the door define an intermediate space filled with insulating material which is closed at the top by an end profile 17 which is placed on the upper edge of the front plate 21 and the rear wall 22. A shank 18 projecting into the intermediate space is formed in one piece on the end profile 17. A thread-bearing section 20 of the screw 10 is screwed in this shank 18. A section 19 of the shank of the screw 10 close to the head passes through two holes in the housing and serves as a shaft for the catch element 7 about which the catch element 7 can be pivoted. A second shank in the end profile 17, which is not shown is used to fix the screw 11 in the door 3. The housing is formed of two half-shells 23, 24, the one being a mirror image of the other. A recess 25 at the top of the upper shell receives the head of the screw 10.

A corresponding recess, not shown, is provided to receive the head of the other screw 11. Mirror-image opposing recesses 26 in the lower half-shell are provided to receive respectively the heads of the screws 10, 11 if the hinge of the door 3 is not mounted at its right edges, as shown in Fig. 1, but at its left edge: precisely the same door safety catch as shown in Fig. 1 can also be used in this case; it is sufficient to fix the angled sheet 6 turned through 180° about the line N to the door bearing 4 now mounted at the left edge of the body and to screw the housing 9 together with the catch element therein, likewise turned through 180° about the line N, in two further shanks 18 of the end profile 17 which are pre-formed in the left end region of the end profile 17.

Figure 3 shows a situation during opening of the door 3. The door 3 pivots away from the body 2. The shaft 19 of the catch element 7 fixedly anchored on the door 3 follows this movement. In this case, the catch element 7 whose sloping face 15 is initially in contact with the sloping face 13 of the tab 12 is pivoted about the screw 10 against the resistance of the spring 8. At the same time, the sloping face 15 of the catch element 7 slides on the sloping face 13 of the tab 12. As a result of the large angle α, the spring 8 is severely compressed; so that a considerable force is required to open the door 3. Figure 2 shows a moment immediately after the sloping face 15 has lost contact with the sloping face 13. As the door 3 pivots further, the sloping face 16 of the catch element 7 comes in contact with the sloping face 14 of the tab 12 since the catch element 7 is pressed against the tab 12 as a result of the restoring force of the spring 8. Tab 12 and catch element 7 slide adjacent to one another on the sloping faces 14 and 16 in parallel contact with one another during the further course of the opening process. The pivoting movement of the door is supported in this case as a result of the restoring force by the spring 8 which presses the catch element 7 against the tab 12. Since the angle β is smaller than α, the force with which the spring 8 now drives the door is smaller than the closing force exerted previously during contact of the sloping faces 13, 15. Forces exerted by the tab 12 on the catch element 7 during the opening process are absorbed by the screw 10 and fed into the door 3. Likewise, as a result of the compression of the spring 8 during the opening process, forces produced at the support point of the spring 8 i.e. at the screw 11 are led into the door 3 by the screw 11.

Figure 4 shows the situation at the moment when the catch element 7 which has meanwhile been pivoted out again by the restoring force of the spring 8, is released by the tab 12.

When the door 3 is closed again, the stages in Figs. 2 to 4 are passed through in the inverse order. In this case, the force with which the spring opposes closing when the sloping faces 14, 16 are in contact, is again smaller than the force with which said spring pushes the door into the closed position when the sloping faces 13, 15 are in contact.